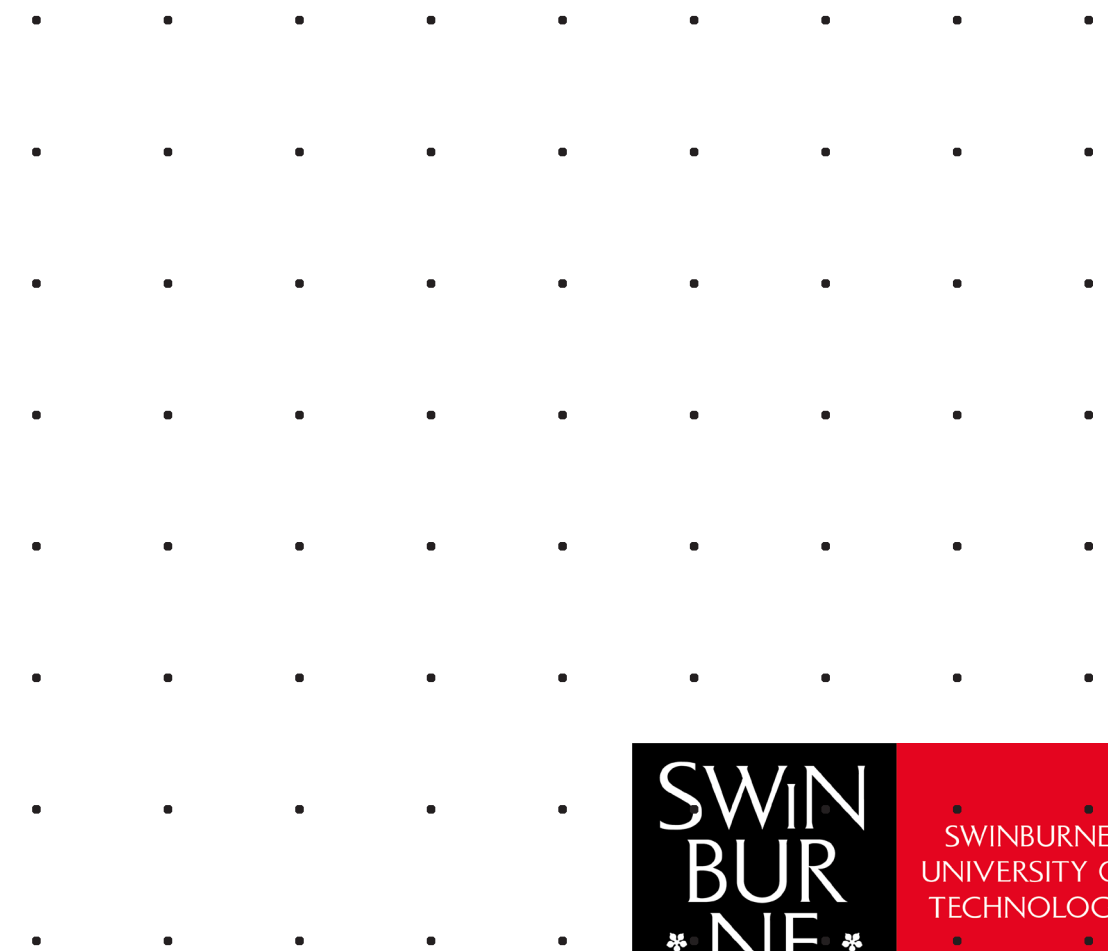


COS20007

Object-Oriented Programming

Topic 02 Part B

Unit Testing



Learning Outcomes

- The importance of Unit Test
- Unit Test Design
- Common Challenges
- Other practical aspects

Testing in Software Development

- Why Testing Matters
 - Verification
 - Validation
- Structured Approach to Testing leads to a comprehensive suite of unit tests
- Benefits
 - Early Detection of Errors
 - Regression Testing
 - Documentation

Unit Test

- Test building block functions
- Key Aspects
 - Isolation
 - Repeatability
 - Coverage

Unit Test (cont.)

- Test as Requirements
- Key Considerations
 - Expected outputs
 - Behavioural Response

The *xUnit* framework provides tools to perform unit testing in many languages

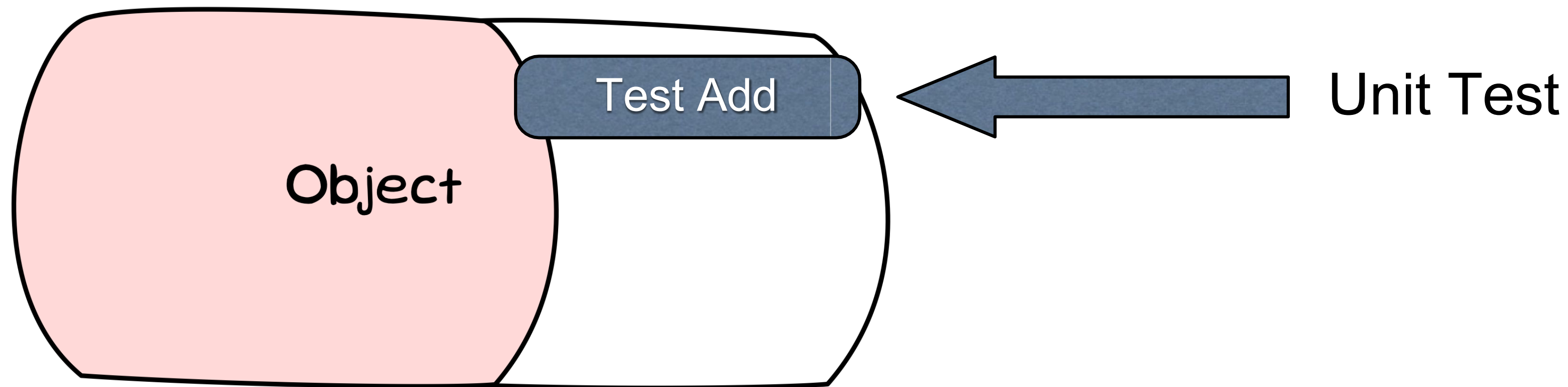
xUnit

NUnit

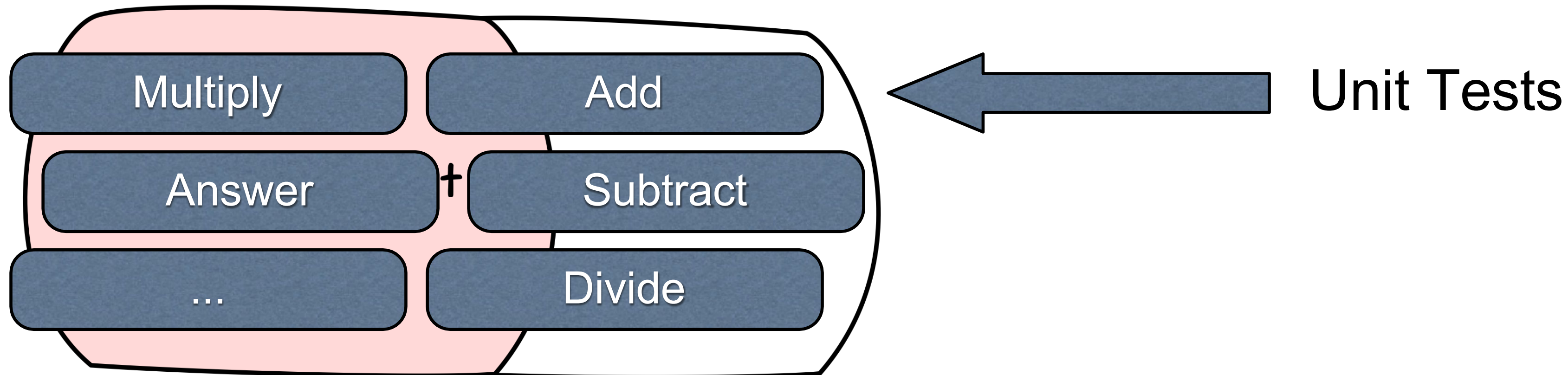
JUnit

...Unit

Each unit test represent a small testable part of your program



Use many small tests to check as much of the program functionality as possible



Create test fixtures to contain unit tests

```
[TestFixture()]
public class TestCalc
{
    [Test()]
    public void TestPush ()
    {
        RpnCalculator c = new RpnCalculator();
        int actual;

        c.Push(5);
        actual = c.Answer();

        Assert.AreEqual(5, actual);
    }
}
```



Setup



Perform



Check

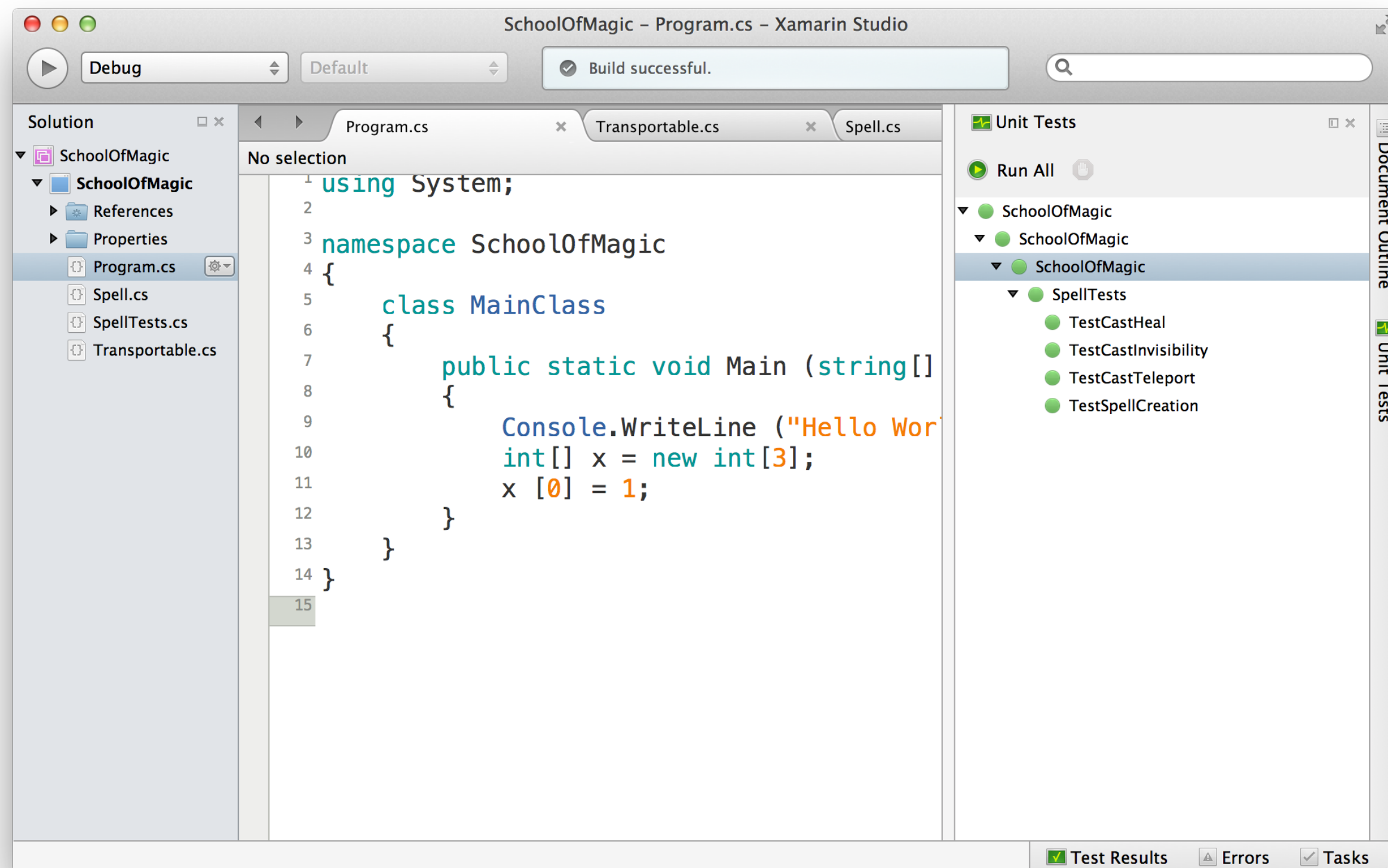
Create Testing Classes

```
namespace Task1_2
{
    public class StudentTests
    {
        [Test]
        public void StudentName_ShouldBeSetCorrectly()
        {
            // Arrange
            Student student = new Student("John Doe", 1);

            // Act
            string name = student.Name;

            // Assert
            ClassicAssert.AreEqual("John Doe", name);
        }
    }
}
```

Use the tools to run all of the tests each time you make changes



Common Challenges in Testing

- Complexity
- Coverage
- Maintenance
- Test Environment Duplication
- Test Data Management

Testing in practices

- Professional Testing Team
- Advanced Testing Practices
 - Integration Testing
 - System Testing
 - Acceptance Testing
 - Security Testing

Take away message

- With OOPs, define the Unit Test as early as possible during the software development
- A class can have many test cases
- Pay attention to common challenges of testing in real-world scenarios